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FREQUENCY OF NEW ONSET RIGHT BUNDLE BRANCH BLOCK IN ACUTE MYOCARDIAL INFARCTION

Original Research

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ABSTRACT

Background: Acute Myocardial Infarction (AMI) remains a critical cardiovascular emergency frequently associated with conduction disturbances, including Right Bundle Branch Block (RBBB). The sudden onset of RBBB during AMI not only complicates electrocardiographic interpretation by masking ischemic changes but may also correlate with worse clinical outcomes such as arrhythmias and heart failure. Despite its clinical importance, limited local data exist regarding the frequency and characteristics of new-onset RBBB among AMI patients, highlighting a gap in regional cardiac research.

Objective: To determine the frequency of new-onset Right Bundle Branch Block in patients presenting with Acute Myocardial Infarction.

Methods: This descriptive cross-sectional study was carried out at the Department of Cardiology, Lady Reading Hospital, Peshawar, over a six-month period. A total of 131 patients aged 18 to 60 years, diagnosed with AMI based on standardized criteria, were enrolled using non-probability consecutive sampling. Patients with previously diagnosed RBBB, cardiac surgery, electrolyte abnormalities, or pregnancy were excluded. Standard 12-lead ECGs were performed on admission, and RBBB was identified by a QRS duration >120 milliseconds and an rSR′ pattern in lead V1. Data were analyzed using SPSS version 26, with chi-square or Fisher's exact test applied for stratification. A p-value <0.05 was considered statistically significant.

Results: Among 131 AMI patients, 19 (14.5%) exhibited new-onset RBBB. Stratified analysis showed RBBB in 11 of 87 males (12.6%) and 8 of 44 females (18.2%) (p=0.41), and in 13 of 82 patients >50 years (15.9%) versus 6 of 49 aged ≤50 years (12.2%) (p=0.57). Diabetics showed a frequency of 17.6% compared to 12.5% in non-diabetics (p=0.43), while hypertensives had a rate of 16.7% versus 11.3% in non-hypertensives (p=0.47). No statistically significant associations were observed across BMI, socioeconomic class, or residential status.

Conclusion: New-onset RBBB was observed in a clinically relevant portion of AMI patients. Although no significant associations were found with baseline variables, the patterns suggest a possible link warranting further exploration in larger, outcome-based multicenter studies.

Keywords: Acute Myocardial Infarction, Cardiac Conduction, Cross-Sectional Study, Electrocardiography, Ischemic Heart Disease, Right Bundle Branch Block, RBBB.

INTRODUCTION

Acute Myocardial Infarction (AMI) remains a leading cause of morbidity and mortality worldwide, characterized by the abrupt cessation or marked reduction in coronary blood flow, most commonly due to thrombus formation over a ruptured atherosclerotic plaque (1). This vascular occlusion results in myocardial ischemia and, if prolonged, leads to irreversible necrosis of cardiac tissue, compromising cardiac function and increasing the risk of complications such as heart failure and arrhythmias (2,3). Clinically, AMI typically presents with retrosternal chest pain, dyspnea, diaphoresis, and autonomic symptoms, necessitating urgent medical intervention. Timely therapeutic strategies such as thrombolysis or percutaneous coronary intervention (PCI) significantly improve patient outcomes by restoring myocardial perfusion (4). Right Bundle Branch Block (RBBB), on the other hand, is an intraventricular conduction delay involving the right bundle branch of the cardiac conduction system. This condition manifests on electrocardiography (ECG) as a widened QRS complex (≥120 ms) and a distinctive rSR' pattern in lead V1, reflecting altered ventricular depolarization (5). While RBBB may occur as a benign incidental finding, it can also signal underlying cardiac pathology including ischemic heart disease, cardiomyopathy, or pulmonary hypertension (6). Importantly, in the setting of AMI, the emergence of a new-onset RBBB may complicate ECG interpretation by obscuring ischemic changes such as ST-segment elevation, thus delaying diagnosis and timely management (7,8).

Emerging evidence suggests a pathophysiological link between AMI and the development of RBBB, particularly in infarctions involving the inferior wall or the right coronary artery territory, where ischemic injury to the conduction system is more likely. Moreover, the presence of RBBB during AMI has been associated with a higher risk of adverse outcomes, including arrhythmias, cardiogenic shock, and increased in-hospital mortality (9,10). Despite its clinical significance, the local frequency and prognostic implications of new-onset RBBB in AMI remain underexplored, creating a critical gap in cardiology research. A recent study reported a 14.29% incidence of new-onset RBBB in patients presenting with AMI, further highlighting the relevance of this conduction abnormality in acute cardiac events (11). Given the scarcity of regional data and the diagnostic and prognostic challenges posed by RBBB in the context of AMI, it is imperative to investigate its local prevalence. Such research could enhance clinical awareness, improve diagnostic accuracy, and guide evidence-based treatment decisions. Therefore, this study aims to determine the frequency of new-onset right bundle branch block in patients presenting with Acute Myocardial Infarction.

METHODS

This cross-sectional study was conducted in the Department of Cardiology at Lady Reading Hospital (LRH), Peshawar, over a duration of six months, commencing immediately after the approval of the research synopsis by the institutional ethical review board. The sample size of 131 patients was determined using the WHO sample size calculator, applying a 95% confidence interval and an appropriate margin of error, based on a previously reported frequency of new-onset right bundle branch block (RBBB) in patients with acute myocardial infarction (AMI). A non-probability consecutive sampling technique was employed to recruit participants. Patients aged between 18 and 60 years of either gender, who fulfilled the operational criteria for AMI, were considered eligible for inclusion. Those with a pre-existing diagnosis of RBBB documented in medical records, known conduction system disorders, significant electrolyte imbalances, a history of cardiac surgery, or confirmed pregnancy by ultrasonography were excluded to avoid confounding factors that could influence ECG interpretation (2,3). All patients meeting the eligibility criteria were enrolled consecutively after obtaining written informed consent. The consent process ensured participants were aware of the voluntary nature of their participation, with assurance of data confidentiality and no interference with clinical care. Ethical approval was secured from the institutional review board (IRB).

Baseline demographic and clinical information was collected through structured interviews and review of medical records. This included age, gender, body mass index (BMI), educational attainment, occupation, monthly income, comorbidities such as diabetes mellitus and hypertension, as well as socioeconomic and residential status. Upon hospital admission, each patient underwent a standard 12-lead electrocardiogram (ECG) within the first hour to assess for any conduction abnormalities. All ECGs were interpreted by trained cardiologists who assessed for new-onset RBBB, defined by a QRS duration greater than 120 milliseconds and an rSR’ pattern in lead V1, in accordance with the operational definition (12,13). Repeat ECGs were conducted during hospitalization if clinically indicated, and the appearance of RBBB was documented using predesigned data collection proformas. Statistical analysis was performed using

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SPSS version 26. Categorical variables such as gender, educational level, profession, diabetes status, hypertension, socioeconomic class, residential status, and presence of RBBB were summarized using frequencies and percentages. Continuous variables including age, BMI, and monthly income were expressed as mean ± standard deviation for normally distributed data, or median with interquartile range (IQR) for non-normally distributed variables. The Shapiro-Wilk test was applied to assess normality. Stratification of new-onset RBBB was carried out across key variables to evaluate potential associations. Post-stratification analysis was performed using chi-square or Fisher's exact test, with a p-value of <0.05 considered statistically significant.

RESULTS

Among the 131 patients diagnosed with Acute Myocardial Infarction (AMI), the mean age was 52.3 ± 6.8 years, ranging from 29 to 60 years. The cohort included 87 males (66.4%) and 44 females (33.6%), with a male-to-female ratio of approximately 2:1. The mean body mass index (BMI) was 27.1 ± 3.4 kg/m². A total of 45 patients (34.4%) had a BMI ≤25, while 86 patients (65.6%) were overweight or obese (BMI >25). Regarding comorbidities, 78 individuals (59.5%) were hypertensive and 51 (38.9%) were diabetic. In terms of socioeconomic distribution, 61.1% of patients belonged to the middle-income group, 24.4% to the low-income group, and 14.5% to the high-income group. Educational background analysis showed that 39.7% had completed secondary education or higher. Urban residents accounted for 53.4% of the sample, while 46.6% resided in rural areas. Out of the total study population, 19 patients (14.5%) were found to have new-onset Right Bundle Branch Block (RBBB) based on ECG criteria, while 112 patients (85.5%) showed no such evidence. When stratified by gender, 11 of 87 males (12.6%) and 8 of 44 females (18.2%) exhibited new-onset RBBB, a difference that was not statistically significant (p = 0.41). Age-wise analysis revealed that 6 of 49 patients aged ≤50 years (12.2%) and 13 of 82 patients aged >50 years (15.9%) had RBBB (p = 0.57). Regarding BMI, RBBB was observed in 5 of 45 patients (11.1%) with BMI ≤25 and in 14 of 86 patients (16.3%) with BMI >25 (p = 0.49). Among diabetics, 9 of 51 (17.6%) had RBBB, compared to 10 of 80 (12.5%) in the non-diabetic group (p = 0.43). Similarly, 13 of 78 hypertensive patients (16.7%) and 6 of 53 non-hypertensive patients (11.3%) were found to have RBBB (p = 0.47). In the socioeconomic breakdown, 6 of 32 low-income patients (18.8%), 10 of 80 middle-income patients (12.5%), and 3 of 19 high-income patients (15.8%) were affected, with no statistically significant associations (p = 0.78). Residential status showed almost equal distribution, with RBBB found in 10 of 70 urban residents (14.3%) and 9 of 61 rural residents (14.8%) (p = 0.94).

Table 1: Stratified Frequency of New-Onset Right Bundle Branch Block Among Patients with Acute Myocardial Infarction

Variable	Group	Total (n)	RBBB (n)	Frequency (%)	p-value
Gender	Male	87	11	12.6%	0.41
	Female	44	8	18.2%	
Age	≤ 50 years	49	6	12.2%	0.57
	> 50 years	82	13	15.9%	
BMI	≤ 25	45	5	11.1%	0.49
	> 25	86	14	16.3%	
Diabetes	Yes	51	9	17.6%	0.43
	No	80	10	12.5%	
Hypertension	Yes	78	13	16.7%	0.47
	No	53	6	11.3%	
Socioeconomic Status	Low	32	6	18.8%	0.78
	Middle	80	10	12.5%	
	High	19	3	15.8%	
Residential Status	Urban	70	10	14.3%	0.94
	Rural	61	9	14.8%	

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Table 2: Frequency of RBBB by Gender

Gender	Total Patients	RBBB Cases	RBBB Frequency (%)	p-value
Male	87	11	12.6%	0.41
Female	44	8	18.2%	

Table 3: Frequency of RBBB by Age Group

Age Group	Total Patients	RBBB Cases	RBBB Frequency (%)	p-value
≤ 50 years	49	6	12.2%	0.57
> 50 years	82	13	15.9%	

Table 4: Frequency of RBBB by BMI

BMI Group	Total Patients	RBBB Cases	RBBB Frequency (%)	p-value
≤ 25	45	5	11.1%	0.49
> 25	86	14	16.3%	

Table 5: Frequency of RBBB by Comorbidities

Comorbidity	Total Patients	RBBB Cases	RBBB Frequency (%)	p-value
Diabetes: Yes	51	9	17.6%	0.43
Diabetes: No	80	10	12.5%	
Hypertension: Yes	78	13	16.7%	0.47
Hypertension: No	53	6	11.3%	

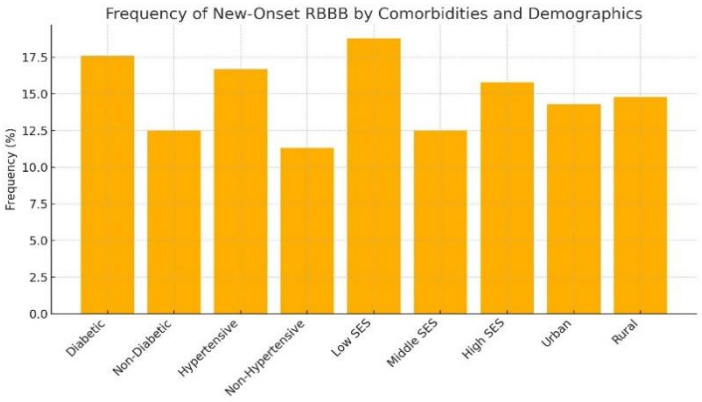

Figure 1 Frequency of New-Onset RBBB by Comorbidities and Demographics

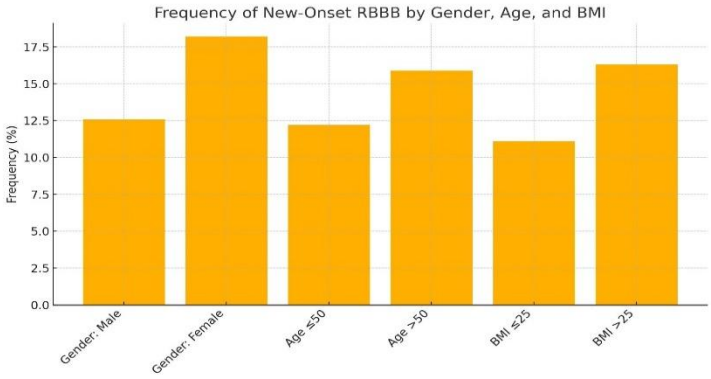

Figure 2 Frequency of New-onset RBBB by Gender, Age and BMI

DISCUSSION

The findings of this study revealed that 14.5% of patients diagnosed with Acute Myocardial Infarction (AMI) exhibited new-onset Right Bundle Branch Block (RBBB), aligning closely with previously reported data indicating a frequency of approximately 14.29% in similar populations (14). The emergence of RBBB during AMI holds notable clinical relevance, primarily due to its potential to obscure hallmark electrocardiographic features such as ST-segment elevation. This masking effect may result in diagnostic delays, compromising the timeliness of interventions like thrombolysis or percutaneous coronary intervention, which are pivotal in minimizing myocardial damage and improving survival outcomes (15-17). The presence of RBBB in the setting of AMI has also been linked with adverse prognostic implications. Studies have demonstrated associations with increased in-hospital mortality, higher incidence of ventricular arrhythmias, and progression to heart failure, emphasizing the need for heightened clinical vigilance when RBBB is identified during acute coronary events (18,19). In this study, stratified subgroup analysis demonstrated higher RBBB frequencies among females, older individuals, and

patients with diabetes or hypertension; however, none of these associations reached statistical significance. These patterns, although not definitive, are consistent with existing literature suggesting that myocardial structural abnormalities and metabolic disorders may contribute to electrical conduction delays (20,21). The lack of significant differences may reflect the limited sample size and underpowering of subgroup analyses rather than a true absence of association. Interestingly, socioeconomic and residential status bore no meaningful correlation with the occurrence of RBBB, indicating that intrinsic cardiovascular pathology and comorbid conditions likely exert a more pronounced influence than environmental or social determinants. This underscores the biological underpinnings of conduction abnormalities in the context of myocardial ischemia.

A key strength of this study lies in its focused objective and structured methodology, including clearly defined operational criteria and timely ECG assessment conducted under clinical supervision. Nevertheless, the study's limitations must be acknowledged. Its single-center design and modest sample size restrict the external validity of findings and limit the power to detect significant subgroup effects. The cross-sectional nature of the research precludes any temporal or causal interpretations, particularly in determining whether RBBB contributes to poorer outcomes or merely reflects more extensive myocardial involvement. Moreover, important clinical variables such as infarct location, extent of myocardial involvement, coronary artery distribution, and treatment modalities were not included in the analysis. These factors could have provided a more comprehensive understanding of the interplay between ischemia and conduction abnormalities. Additionally, the absence of follow-up data restricts insight into the prognostic trajectory of patients who developed RBBB during hospitalization. Future research should focus on multicenter studies with larger sample sizes to validate the findings and strengthen subgroup analyses. Incorporating angiographic, echocardiographic, and long-term clinical outcome data would further elucidate the prognostic significance of RBBB in AMI (22,23). Understanding these dynamics may improve early risk stratification and inform clinical decision-making to optimize patient outcomes.

CONCLUSION

This study concludes that new-onset Right Bundle Branch Block is a notable finding among patients presenting with Acute Myocardial Infarction and carries important clinical implications. Although no significant associations were observed with demographic or comorbid factors, the trends identified highlight the relevance of continuous ECG monitoring in the early detection of conduction abnormalities. Recognizing RBBB in the acute setting is vital, as it can influence both diagnosis and management strategies. These findings underscore the need for expanded research to explore its prognostic value and to inform more targeted approaches in the care of patients with myocardial infarction.

AUTHOR CONTRIBUTION

Author	Contribution
Atif Kamal	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Tariq Nawaz*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Sher Ali Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Waseem Iqbal	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Saddam Hussain	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Roman Khan	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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REFERENCES

1. Michaud K, Basso C, d'Amati G, Giordano C, Kholová I, Preston SD, et al. Diagnosis of myocardial infarction at autopsy: AECVP reappraisal in the light of the current clinical classification. Virchows Arch. 2020;476(2):179-94.
2. Buja LM. Pathobiology of myocardial ischemia and reperfusion injury: models, modes, molecular mechanisms, modulation, and clinical applications. Cardiol Rev. 2023;31(5):252-64.
3. Lupu L, Taha L, Banai A, Shmueli H, Borohovitz A, Matetzky S, et al. Immediate and early percutaneous coronary intervention in very high-risk and high-risk non-ST segment elevation myocardial infarction patients. Clin Cardiol. 2022;45(4):359-69.
4. keda T. Right bundle branch block: current considerations. Curr Cardiol Rev. 2021;17(1):24-30.
5. Hassine M, Kallala MY, Jamel A, Bouanene I, Bouchahda N, Mahjoub M, et al. The impact of right bundle branch block and SIQIII-type patterns in determining risk levels in acute pulmonary embolism. F1000Res. 2023; 12:545-9.
6. Basit H, Kahn A, Zaidi S, Chadow H, Khan A. A case of ST-elevation myocardial infarction with right bundle branch block, an ominous sign of critical coronary occlusion. Cureus. 2022;14(1): e21216-9.
7. Ardiana M, Sufiyah IM, Hamdani MN. Right bundle branch block evolving to myocardial ischemia in a patient with chronic middle back pain: a case report. J Med Case Rep. 2023;17(1):149-52.
8. Rehman S, Rahim A, Ali J, Sajjad W, Bilal A, Ullah R, et al. Frequency of new onset right bundle branch block in acute myocardial infarction and its coronary angiographic findings in patients presenting at Tertiary Care Hospital, Peshawar. Pak J Cardiovasc Interv. 2022;2(1):28-34
9. Figueroa-Triana JF, Mora-Pabón G, Quitian-Moreno J, Álvarez-Gaviria M, Idrovo C, Cabrera JS, et al. Acute myocardial infarction with right bundle branch block at presentation: Prevalence and mortality. J Electrocardiol. 2021;66:38-42.
10. Galcerá-Jornet E, Consuegra-Sánchez L, Galcerá-Tomás J, Melgarejo-Moreno A, Gimeno-Blanes JR, Jaulent-Huertas L, et al. Association between new-onset right bundle branch block and primary or secondary ventricular fibrillation in ST-segment elevation myocardial infarction. Eur Heart J Acute Cardiovasc Care. 2021;10(8):918-25.
11. Basit H, Kahn A, Zaidi S, Chadow H, Khan A. A Case of ST-Elevation Myocardial Infarction With Right Bundle Branch Block, an Ominous Sign of Critical Coronary Occlusion. Cureus. 2022;14(1):e21216.
12. Littmann L. Common ECG interpretation software mistakes. Part I: False reporting of myocardial infarction. J Electrocardiol. 2023;81:32-5.
13. Nikus K, Birnbaum Y, Fiol-Sala M, Rankinen J, de Luna AB. Conduction Disorders in the Setting of Acute STEMI. Curr Cardiol Rev. 2021;17(1):41-9.
14. Khawaja M, Thakker J, Kherallah R, Ye Y, Smith SW, Birnbaum Y. Diagnosis of Occlusion Myocardial Infarction in Patients with Left Bundle Branch Block and Paced Rhythms. Curr Cardiol Rep. 2021;23(12):187.
15. Meyer MR, Radovanovic D, Pedrazzini G, Rickli H, Roffi M, Rosemann T, et al. Differences in presentation and clinical outcomes between left or right bundle branch block and ST segment elevation in patients with acute myocardial infarction. Eur Heart J Acute Cardiovasc Care. 2020;9(8):848-56.
16. Shrivastav R, Perimbeti S, Casso-Dominguez A, Jneid H, Kwan T, Tamis-Holland JE. In Hospital Outcomes of Patients With Right Bundle Branch Block and Anterior Wall ST-Segment Elevation Myocardial Infarction (From a Nationwide Study Using the National Inpatient Sample). Am J Cardiol. 2021;140:20-4.
17. Pérez-Riera AR, Barbosa-Barros R, Andreou AY, Fiol-Sala M, Birnbaum Y, da Silva Rocha M, et al. Left septal fascicular block: Evidence, causes, and diagnostic criteria. Heart Rhythm. 2023;20(11):1558-69.
28. Xenogiannis I, Kolokathis F, Alexopoulos D, Rallidis LS. Myocardial infarction due to left main coronary artery total occlusion: A unique electrocardiographic presentation. J Electrocardiol. 2023;76:26-31.
29. Macfarlane PW. New ECG Criteria for Acute Myocardial Infarction in Patients With Left Bundle Branch Block. J Am Heart Assoc. 2020;9(14):e017119.
20. Birnbaum Y, Ye Y, Smith SW, Jneid H. Rapid Diagnosis of STEMI Equivalent in Patients With Left Bundle-Branch Block: Is It Feasible? J Am Heart Assoc. 2021;10(18):e023275.
21. Lee WC, Fang YN, Chen TY, Hsieh YY, Tsai YH, Fang HY, et al. The Relationship of Conduction Disorder and Prognosis in Patients with Acute Coronary Syndrome. Int J Clin Pract. 2022;2022:9676434.
22. Rector G, Triska J, Ajene G, Wang A, Haddadin F, Jabri A, et al. Right Bundle Branch and Bifascicular Blocks: Insensitive Prognostic Indicators for Acute Myocardial Infarction. Curr Probl Cardiol. 2023;48(1):101418.

23. Senftinger J, Sörensen NA, Blankenberg S, Clemmensen P. Right bundle branch block in suspected acute coronary syndromes: Diagnostic challenges, treatment and prognosis. J Electrocardiol. 2024;87:153824.